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the great changes have been brought about by the will of a determined minority who have succeeded in the long run because their policies and ideas have been sound with respect to the tendencies of a whole people.

#### GEOLOGY AND GEOGRAPHY OF CENTRAL CÉLEBES

E. C. ABENDANON. *Voyages géologiques et géographiques à travers la Célèbes Centrale (1909-1910)*. Vol. 1, xxvii and 443 pp.; diagrs., ill.; Vol. 2, xv and pp. 445-969; maps, diagrs., ill.; Vol. 3, xxii and pp. 971-1548; contributions of G. F. Dollfus, G. J. Hinde, J. H. Kruimel, S. J. Vermaes, and M. Weber, maps, ill.; Atlas, with the collaboration of J. J. Lefèvre, W. Schiebel, Raden Mas Amad, A. Raven, and W. F. Pandeij; sheets 1-12, 12B, 13-16. Publ. by the Royal Geographical Society of the Netherlands with the collaboration of the Ministry of the Colonies. E. J. Brill, Leyden, 1916-18. 11 x 8 inches. Atlas, 22 x 15 inches.

Of the numerous islands of the Malay Archipelago perhaps none is so interesting as the island of Celebes. Ever since the great English naturalist Alfred Russel Wallace made known to the scientific world more than sixty years ago the results of his observations, this island has been classical ground for the zoögeographer and naturalist. On the basis of his faunal studies he established what is known as the "Wallace line" which extends through the Strait of Macassar from north to south between Borneo and Celebes and which is supposed to be the dividing line between the Oriental and the Australian faunal regions. The controversy which followed this generalization had at least one beneficial effect in that it stimulated other naturalists to explore the island of Celebes more closely. The result is a vast amount of international literature bearing on this subject.

The establishment of the "Wallace line" involved the geological deduction that, during relatively recent geologic time, Celebes had belonged to the Australian continent, whereas Borneo had been part of the continent of Asia. But years elapsed before geologists participated in the discussion in the light of their own investigations on the ground. As a matter of fact, more or less systematic geological studies have been made only during the last twenty or perhaps thirty years. The names of Martin, Wichmann, Bücking, and the brothers Sarasin are worthy of mention as pioneers in this respect. During the last ten years, however, a change for the better has set in and, of late, very important geological work has been done by such men as Wanner, Ahlburg, Hirschi, Hotz, Gogarten, and especially by the Dutch mining engineer and geologist Abendanon. The results of his latest expedition, made in 1909-1910, have been published in the work under review, comprising three magnificent volumes with numerous text figures and beautiful plates, besides an atlas of maps and profiles.

The work deals particularly with the geology and geomorphology of the central part of the island; only scant and scattered reference is made to the response of human life to its particular environment as we now are wont to define geography. The first two volumes give a detailed description of the preparation for and the daily progress of the expedition which had as its main object a geologic and topographic reconnaissance of the region. The third volume summarizes the results achieved in their bearing on general problems. It includes reports from various specialists on the material collected on the trip, such as contributions on the paleontology by G. J. Hinde and G. F. Dollfus, on fresh-water molluscs by H. J. Kruimel, on fresh-water fishes by M. Weber, and on some phases of the economic geology by S. J. Vermaes.

According to Abendanon the following elements, in addition to the coastal plains, can be recognized in the configuration of central Celebes:

1. A highly folded and faulted Pre-Cambrian gneiss-granite-schist complex in the central part.

All of it formed, during early Paleozoic time, part of a vast continent "Aequinoctia" (see E. C. Abendanon: *Aequinoctia, an Old Paleozoic Continent*, *Jour. of Geol.*, Vol. 27, 1919, pp. 562-578) and has since undergone submergence, upheaval, and peneplanation. Recent crustal movements have produced a network of *graben* and horsts. One of the major depressions is the Posso *graben*, some 75 kilometers long in a north to south direction, part of which is now occupied by a beautiful lake of that name. Another *graben* is the Fossa Sarasina—the Sarasin trough—to the west of the former. It is composed of a series of minor troughs in a north to south direction together about 100 kilometers long. Frequent earthquakes indicate that the crustal equilibrium in this part has not yet been established.

2. A coastal range to the west along the Strait of Macassar. As yet little more is known of this range beyond the fact that it is a folded chain of mountains of late Tertiary age.

3. An uplifted peneplain region to the east, the Verbeek Mountains, named after the Dutch geologist who has contributed so much to the geological investigation of the Dutch East Indies.

This region consists essentially of a peridotite batholith, at least 1,100 meters in thickness and of so vast an extent as to constitute, perhaps, the largest single occurrence of peridotite on record. This peridotite batholith of probable Mesozoic age is overlain, in places, by Pre-Tertiary sediments, 200–300 meters thick, part of which are highly folded.

The peridotite is nickel-bearing and may sometime become of great economic importance. The altered rock has given rise to extensive accumulations of lateritic iron ores similar to those found in Cuba but richer in iron and containing nickel in addition to smaller amounts of cobalt.

4. Several folded mountain ranges southwest of the central basal complex.

Some of these are composed of sedimentary deposits of Cretaceous and early Tertiary age; others are made up of various kinds of igneous rocks.

These ranges are separated from the mountains of southern Celebes by a depression running across the southern peninsula from the Gulf of Boni to the Strait of Macassar. This trough has become uplifted above sea level very recently, in Quaternary time; in fact, Abendanon has found evidence indicating that during the last fifty years the western part, at least, has been uplifted not less than five meters.

A short chapter treats of the peoples, who constitute three fairly distinct groups.

1. The coast people, who are Mohammedans and do not differ materially from the coastal people of other parts of the island. They are tradesmen and hardy navigators, but poor farmers.

2. The people of the mountainous regions, comprising different races known under the collective name of Toradjas. They are animists and live on the products of primitive agriculture and of the forests. They have developed arts and crafts to a relatively high degree. Aside from their passion for gambling they possess on the whole very desirable traits and have a capacity for higher development.

3. The primitive people of the dense forests, often heard of but not seen by the author except, perhaps, in a single instance.

A long chapter is devoted to the history of the cartography of the whole island of Celebes, from Ptolemy's time to the present, an exceedingly interesting review with numerous reproductions of historical maps as made by the earlier Portuguese and Dutch navigators.

The last chapter is given over to a short discussion of the origin of the word Celebes, which seems to have been derived from the native word "selihe," equivalent to "current" or "stream," referring probably to the strong ocean current observed off the northeastern coast of the island.

M. W. SENSTIUS

#### EXPLORATION IN CENTRAL BORNEO

**CARL LUMHOLTZ.** *Through Central Borneo: An Account of Two Years' Travel in the Land of the Head-hunters Between the Years 1913 and 1917.* Vol. 1, xix and 242 pp.; ill.; Vol. 2, x and pp. 243–467; map, ill., index. Charles Scribner's Sons, New York, 1920. 9½ x 6½ inches.

Dr. Carl Lumholtz, author of these two volumes of travel in central Borneo, died at Saranac Lake, May 6, 1922, at the age of 71 years. He was a Norwegian explorer and anthropologist of international repute. His first expedition was made in 1880–1884 to Australia as zoölogical collector for the Museums of the University of Christiania. Among his mammalian discoveries on this expedition was the tree kangaroo of Australia. A narrative of the expedition was given in "Among Cannibals" (1889). In 1890–1891 he headed an anthropological expedition for the American Museum of Natural History and the American Geographical Society to the northern Sierra Madre Occidental, which was followed by other expeditions in the Mexican field described in "Unknown Mexico" (1902). An expedition in 1909–1910 resulted in "New Trails in Mexico" (1912).

In August, 1913, Dr. Lumholtz set out from Christiania with the intention of exploring the unknown interior of New Guinea on an expedition financed by the King and Queen